

A NEW NEARCTIC *GLYPHIDOCERA* WITH
DESCRIPTIONS OF ALL STAGES
(LEPIDOPTERA: BLASTOBASIDAE: SYMMOCINAE)

D. ADAMSKI AND R. L. BROWN

Department of Entomology, Drawer EM, Mississippi State University, Mississippi State, Mississippi 39762.

Abstract.—A new species of Blastobasidae, *Glyphidocera juniperella* Adamski, from southeastern United States is described. This species feeds on *Juniperus* and is a pest on ornamental varieties. Illustrations of the adult, male and female genitalia, and larval chaetotaxy are provided. Scanning electron micrographs of egg, larva, pupa, and abdominal sex scales of male adult are included.

Glyphidocera and its type-species, *G. audax*, were described from Saint Vincent Island in the West Indies by Walsingham (1892). Thirty-nine species occur in the New World tropics and 9 species occur in America north of Mexico. Host plants and biology of these species are unknown.

Many *Glyphidocera* are uniformly brown and usually possess relatively broad and truncate forewings. The genitalia are characterized by the following: male with valvae narrowed basally, abruptly broadened distally, apex protracted; costa with fingerlike projection at base; gnathos projecting from beneath tuba analis; aedeagus with medium to large cornutus; female usually with ductus bursae sclerotized and apically expanded; ductus seminalis spiralled and originating from posterior end of corpus bursae; corpus bursae with two patches of denticles at the anterior and posterior ends, and usually with a sclerotized plate near constricted end of ductus bursae.

This study resulted from the discovery of larvae of a new species of *Glyphidocera* feeding on nursery stock varieties of *Juniperus horizontalis* Moench, in Mississippi and Florida. The biology of this species has been

studied by Schiffhauer and Mizell (accepted for publication), and insecticides have been evaluated for its control by Mizell and Schiffhauer (accepted for publication).

MATERIALS AND METHODS

The adult, egg, larva, and pupa were examined with an incandescent light source (reflected light). *The Methuen Handbook of Colour* (Kornerup and Wanscher, 1978) was used as a color standard for the description of the adult. Genitalia were dissected as described by Clarke (1941), except Mercurochrome and chlorazol black were used as stains. All preparations were examined with dissecting and compound microscopes.

The ultrastructure of egg, larva, pupa, and abdominal sex scales of males was studied with a Hitachi HH-S-2R scanning electron microscope at an accelerating voltage of 20 kV. For SEM examination, immature specimens were fixed in 3% glutaraldehyde in 0.1 M potassium phosphate buffer (pH 7.3), rinsed in phosphate (pH 7.3), and postfixed in 2% osmium tetroxide in 0.1 M potassium phosphate (pH 7.3). After dehydration in ethyl alcohol, specimens were critical point dried, mounted on stubs with silver paint



Fig. 1. Holotype of *Glyphidocera juniperella* Adamski (male) (9.2×).

and paste, and coated with gold-palladium in a Polaron E5100 sputter coater.

Abbreviations used in this paper are: ANT, antenna; AX TB, axillary tubercle; C, cremaster; FR CL S, frontal clypeal suture; GL, galea; L3 (Fig. 28), metathoracic leg; LB, labium; LBP, labial palp; MD, mandible; MX, maxilla; MXP, maxillary palp; ?, pit (chordotonal organ, pore, other); PIV A, pivot area; PR SC, proleg scars; SP, spiracle; SPIN, spinneret; TON FIB PL, tonofibrillary platelets.

***Glyphidocera juniperella* Adamski,
NEW SPECIES**

Adult.—**Head:** Scales light-brown or greyish-orange basally, greyish-orange apically; frons usually lighter than vertex; antenna dorsally with dark-brown and greyish-orange scales intermixed, ventrally with greyish-orange; labial palpus medially light greyish-orange, or light greyish-orange scales intermixed with dark-brown scales, later-

ally dark-brown, apex of second segment usually greyish-orange.

Thorax: Tegulae, mesonotum, and metascutum dark-brown or with dark-brown scales intermixed with greyish-orange scales; color of legs similar to labial palpi.

Forewing (Fig. 1): 7.0–8.5 mm long; dorsal surface with greyish-orange scales intermixed with dark-brown scales, appearing uniformly light-brown without microscope; one to two small dark-brown spots present in discal cell near distal end and near middle; some specimens with dark-brown spots near base and on Cu near middle of wing; fringe scales brownish-grey. Ventral surface brownish-grey.

Hindwing: Dorsal surface light orange-grey at base, becoming greyish-orange apically; ventral surface light brownish-grey, intermixed with dark-brown on costa.

Abdomen: Greyish-orange scales intermixed with dark-brown scales; male with irregular, transverse row of sex scales on

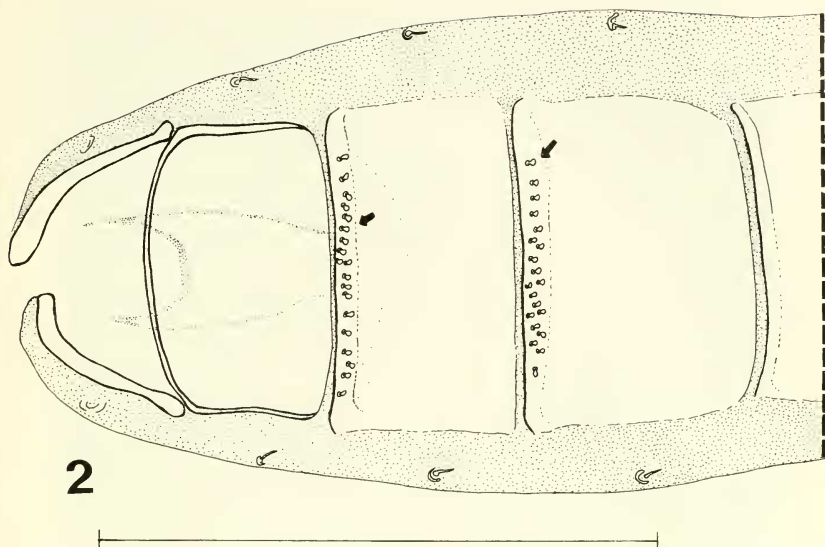


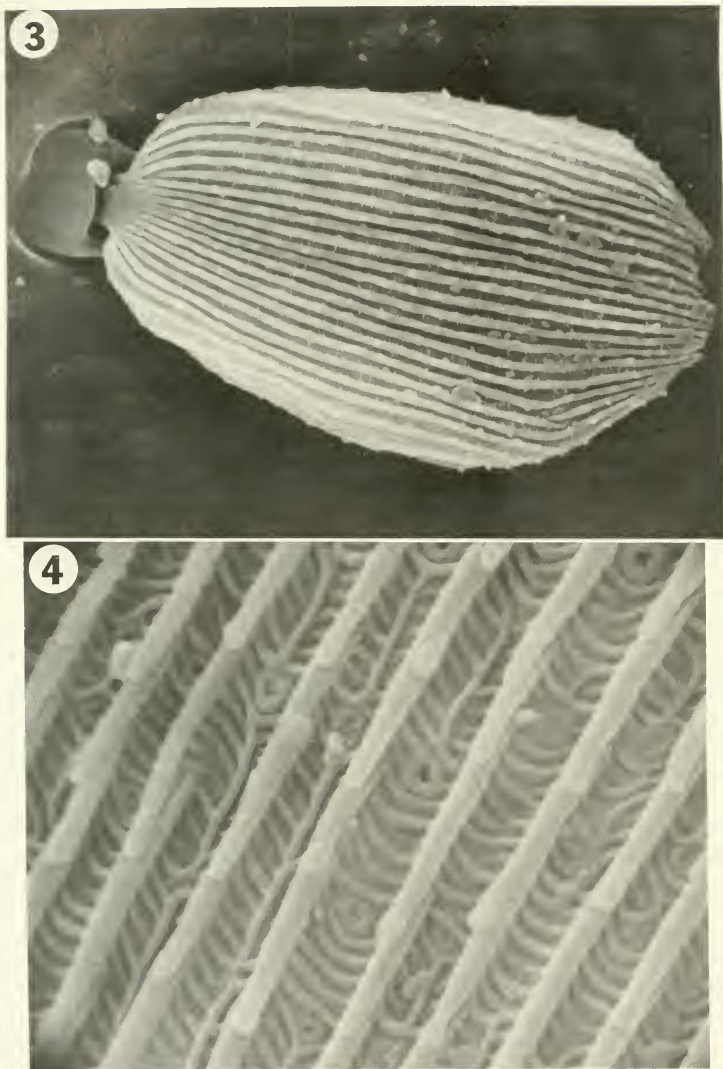
Fig. 2. Dorsal view of abdominal terga 1-4 of male *Glyphidocera juniperella*. Sex scales are indicated by arrows pointed towards anterior margins of terga 3-4. Line scale = 1 mm.

anterior margins of terga III and IV (Fig. 2); each scale with sub-parallel sides, obtuse apex, with base abruptly curved to short pedicel (Fig. 3); interr ridge grooves deep, fenestrae oval, irregularly spaced, each circumscribed by a wide rim; some cross ribs medially fused and parallel with longitudinal ridges (Fig. 4).

Male genitalia (Fig. 5): Tegumen with heavily sclerotized anterior margin, scaled laterally below gnathos; uncus without scales or setae, dorsally sclerotized and confluent with tegumen, ventrally sclerotized to near base; gnathos fused and projecting dorsally from below tuba analis, sparsely setose; aedeagus long, cornutus medium sized; juxta dorsally rolled around base of aedeagus, ventrally narrowed and elongated; valva heavily sclerotized except for ventral half of cucullus and medial groove from base to cucullus; costa sparsely setose, basally with

fingerlike, apically setose projection; cucullus with ventral half densely setose, dorsal half relatively bare; saccus with single row of 5-7 setae near middle and numerous setae on ventral margin.

Female genitalia (Fig. 6): Sternum and tergum VII lightly sclerotized and evenly scaled; sternum and tergum VIII with numerous microtrichia that increase in density toward posterior margins, with several long, simple setae restricted to posterior half of sclerites; papillae anales with two types of setae: type I setae long, simple, directed posteriorly and posterolaterally; type II setae (visible at high magnification) minute, recurved, and directed laterally; antrum with two internal, basal prongs, each directed posterolaterally; corpus bursae with smooth, sub-circular plate near antrum, anterior cluster of denticles near inception of ductus seminalis, and posterior cluster of denticles



Figs. 3, 4. SEM of abdominal sex scales of male *Glyphidocera juniperella*. 3, 4000 $\times$. 4, 20,000 $\times$.

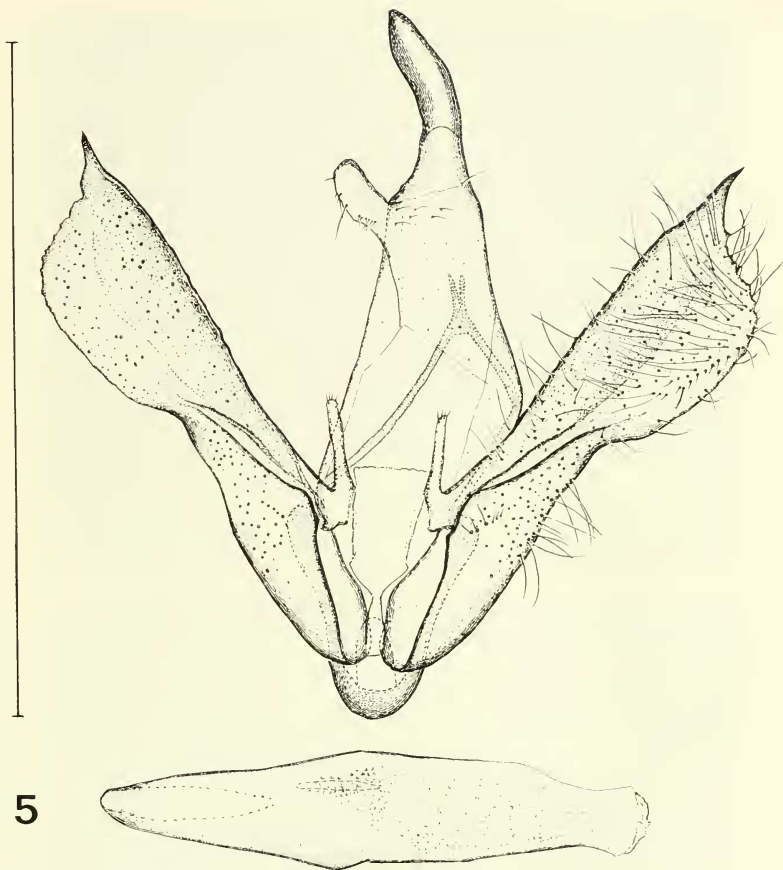


Fig. 5. Genitalia of male *Glyphidocera juniperella* (aedeagus is detached). D. Adamski Gen. Slide no. 2854. Scale = 1 mm.

at the posterior end; ductus seminalis spiralled, bearing cluster of denticles near base.

Egg.—Eggs laid singly or in imbricate clusters on scales of branchlets of *Juniperus* spp. Egg (Figs. 7–8) width nearly two-thirds the length; broadly raised along the median longitudinal axis and flattened towards the outer margin. The surface is characterized by slightly raised convolutions. Aeropyles

appear to be distributed nonrandomly over the dorsal surface. A distinct micropylar area has not been detected. Color changes of the embryo (ranging from yellow-orange to dark-brown) are readily observable through the translucent chorion.

Larva.—Length 12.0–15.6 mm [10n]. Body greyish-brown with a velvety textured appearance due to slightly raised stellate cu-

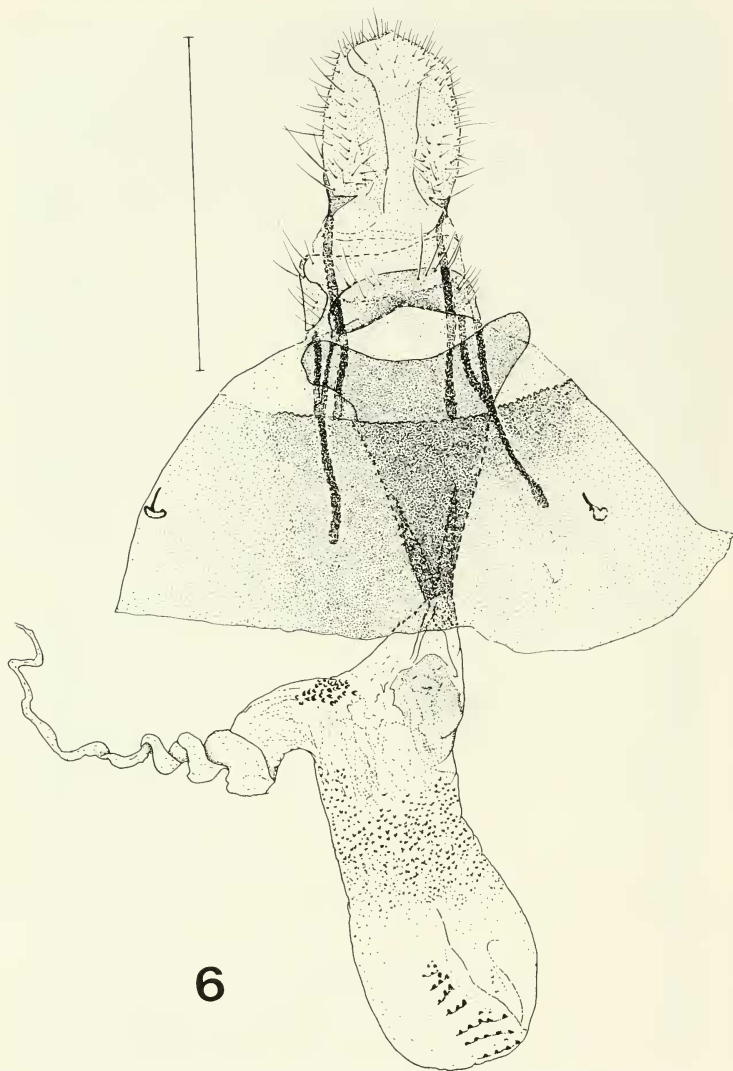
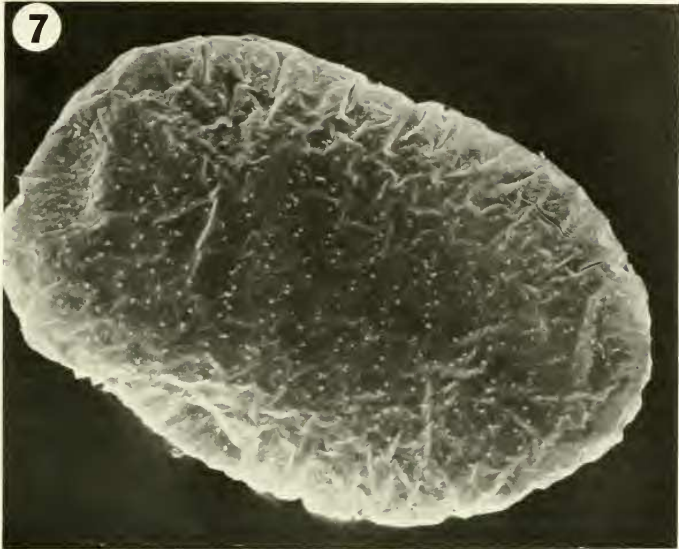


Fig. 6. Genitalia of female *Glyphidocera juniperella*. D. Adamski Gen. Slide no. 2855. Line scale = 1 mm.

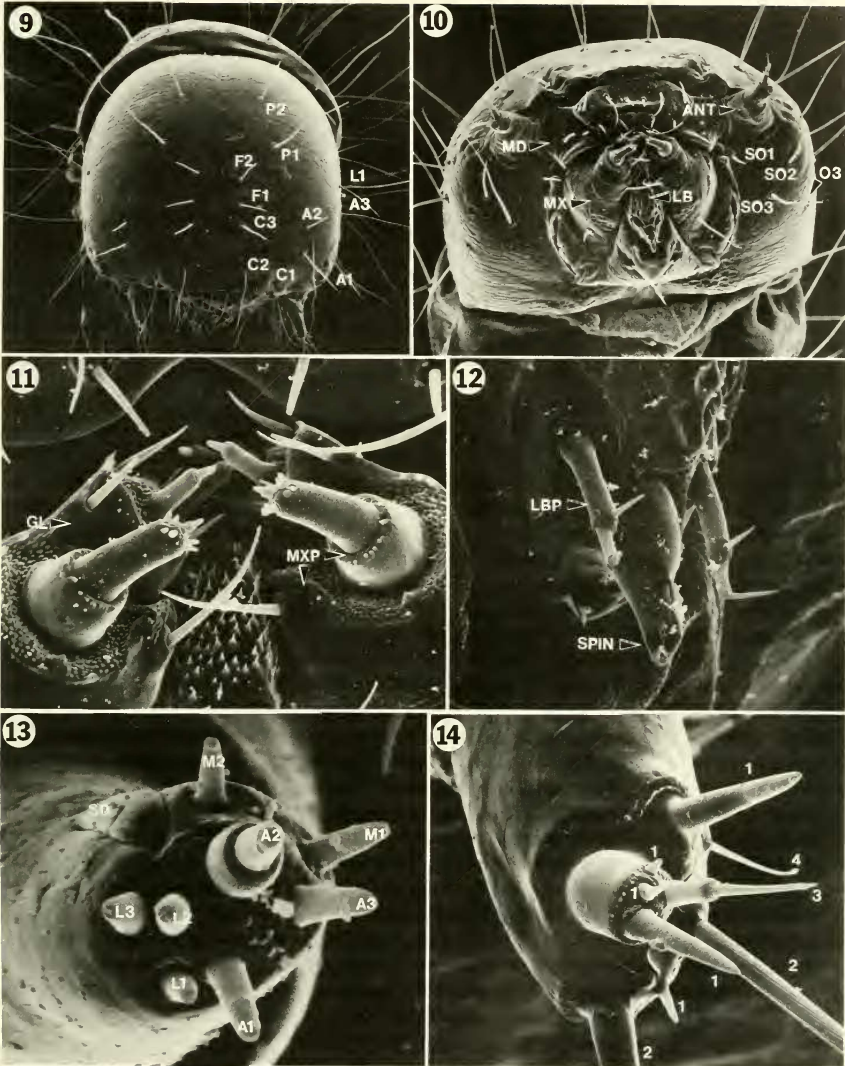


Figs. 7, 8. SEM of egg of *Glyphidocera juniperella*. 7, 150 $\times$. 8, 750 $\times$ (arrows point to aeropyles).

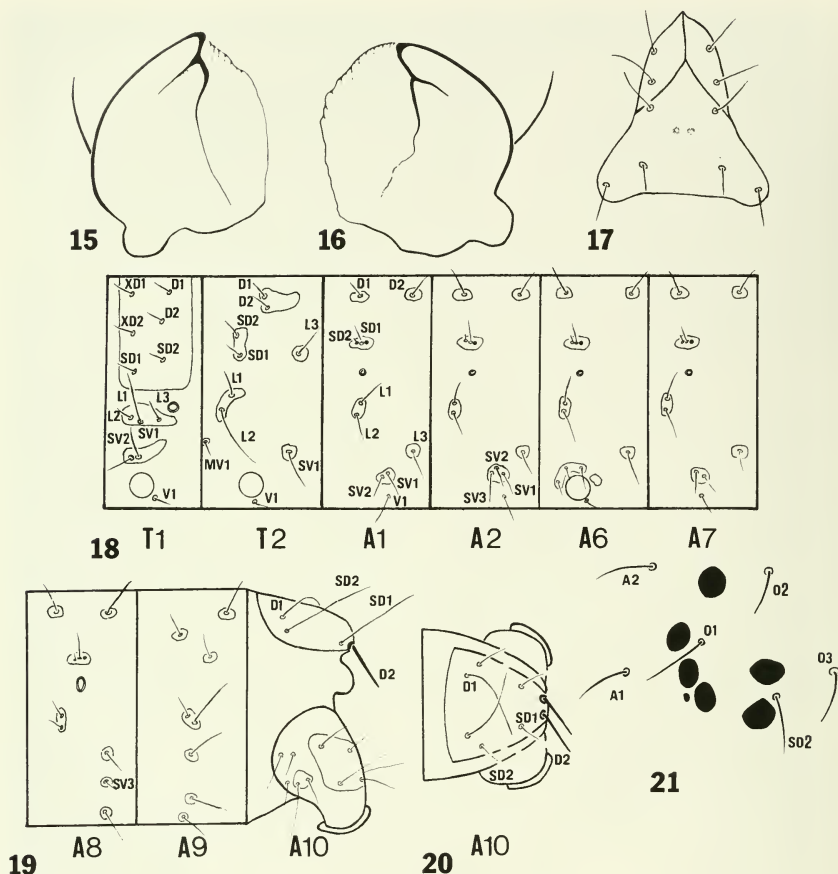
ticular projections on the surface; head capsule, prothoracic shield, anal plate, pinacula, and legs dark brown. Head (Figs. 9–10): hypognathous; epicranium with ridges arranged polygonally, ridges on mouthparts indistinct; adfrontal sclerites broad (Fig. 17), delimiting frons dorsolaterally; frons closed; F1, F2, and C3 sub-equal in length; F1 closer to C3 than F2, in straight line with C2; P1 long, closer to P2 than A2; A1 closer to A2 than to A3; C1 arising from small depression on ventral lateral margin of clypeus, C2 closer to C1 than C3; labrum with distal margin modified into two lobes projecting medially, with 12 setae, two medial pairs, with outer pair at least four times length of inner pair, one pair on each lateral margin, and two pairs on distal margin; mandibles (Figs. 10, 15–16) slightly asymmetrical, with pair of setae on outer surface (basal seta longer than distal seta (Fig. 10)); labium strongly ridged distally, with microtrichia proximally; submental pit absent; spinneret bulbous at base, narrowed distally; labial palpus two segmented, each segment with a dorsally directed apical seta; maxilla (Figs. 10–11, 13) prominent; sensilla types and arrangement on medial lobe and apex of palpus (Figs. 11, 13), similar to those of *Choristoneura fumiferana* (Clem.) (Albert, 1980), *Heliothis zea* (Boddie), (Avé, 1981), and other ditrysian Lepidoptera (Grimes and Neunzig, 1986a, b). Stemmata III and IV approximate, associated setae as in Fig. 21. Sensilla types on antenna (Fig. 14) similar to other Lepidoptera (Schoonhoven and Dethier, 1966). Prothorax (Fig. 18): prothoracic shield medially bisected by ecdysial line; D1 and D2 parallel or sub-parallel, D1 slightly more than half the length of D2; L1 at least twice the length of L2, closer to L2 than L3, and slightly below line between L2 and L3, L2 and L3 sub-equal in length; SV1 and SV2 widely divergent, SV2 slightly shorter than SV1 and pointed posteriorly; distance between SV1 and SV2 less than distance between L1 and L2. Me-

sothorax (Fig. 18): D1 anterodorsal to D2, on same pinaculum; D1 slightly more than half the length of D2, SD2 slightly more than half the length of SD1; L2 and L1 divergent, on same pinaculum; L2 more than twice length of L1; L3 posterodorsal to L1; MV1 on small pinaculum, located within fold on anteroventral margin of segment between L and SV groups. Metathorax as described for mesothorax. Abdomen (Figs. 18–20, 22–26): prolegs on A3–6 and A10 and of equal size; crochets uniserial and biordinal (Fig. 26); D1 and D2 parallel or sub-parallel on A1–9; D1 anterior to and widely separate from D2 on A1–8, and anteroventral and closer to D2 on A9; SD1 and SD2 dorsal to spiracle on A1–8, SD2 minute, detectable only at high magnification (Figs. 22–23); SD1 and SD2 on A1–8 approximate to an invagination on pinaculum; L1 and L2 in nearly straight line with spiracle and SD1 on A1, anterior to line between spiracle and SD1 on A2–8, L3 pinaculum posteroventral to L1 and L2 pinaculum on A1–8, ventral to L1 and L2 pinaculum on A9, L3 in straight line with L2 and SV3 on A9; SV bisetose on A1 and A7, trisetose on A2–6, unisetose on A8–9; V1 pinacula in or near straight line between each pair of SV's on A7–8, slightly anterior to line between SV's on A9, V1's slightly closer on A9 than A7–8; A10 with D1's athwart (Fig. 20); D2's stout, recumbent, and directed ventrally (Figs. 25, 27). Small, slightly pigmented, irregularly shaped and sized, tonofibrillary "platelets" are located in transverse folds of T2–3, on intersegmental membrane of T2–A9 on two irregular lines, one between D and SD setal groups, and one between spiracles and L setal groups (Figs. 22, 24).

Pupa.—Pupa (Figs. 28–34): scabrous, anteriorly truncate, widened in thoracic region, narrowed posteriorly to a bifurcate cremaster; ecdysial line extending from posterior margin of metathorax to anterior margin of vertex; axillary tubercles (cocoon cutter) located on each anterolateral margin



Figs. 9–14. SEM of larva of *Glyphidocera juniperella*. 9, Frontal view of head capsule, 55 $\times$. 10, Ventral view of head capsule, 150 $\times$. 11, Maxillae, 850 $\times$. 12, Labium, 1000 $\times$. 13, Sensilla on apex of maxillary palpus, 5000 $\times$. A2 = sensillum styloconicum; A1, A3, M1, M2, L1, L2, and L3 = sensilla basiconica; SD = sensillum digitiform; 14, sensilla on apical portion of antenna, 2500 $\times$, 1 = sensilla basiconica, 2 = sensilla chaetica, 3 = sensillum styloconicum, 4 = sensillum trichodeum.

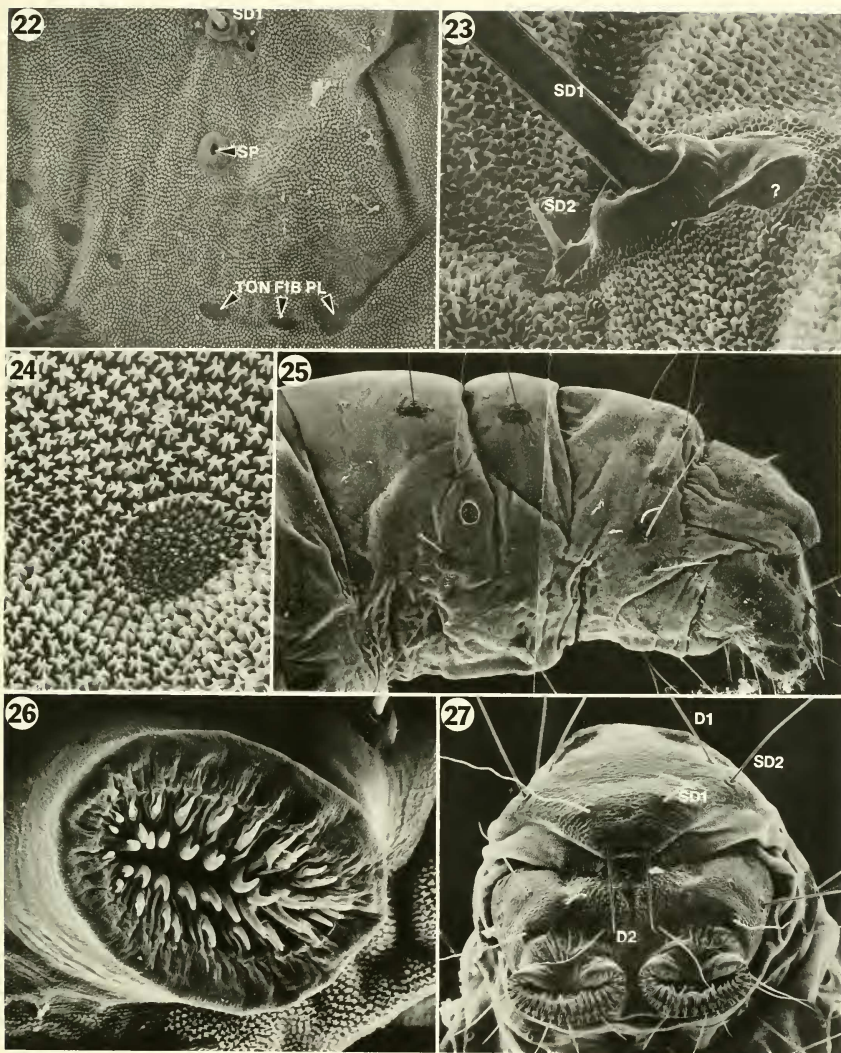


Figs. 15-21. Larva of *Glyphidocera juniperella*. 15, Right mandible. 16, Left mandible. 17, Frons and associated setae. 18, Setal map of thorax and A1-7. 19, Setal map of A8-10. 20, Setal map of A10. 21, Arrangement of stemmata with associated setae.

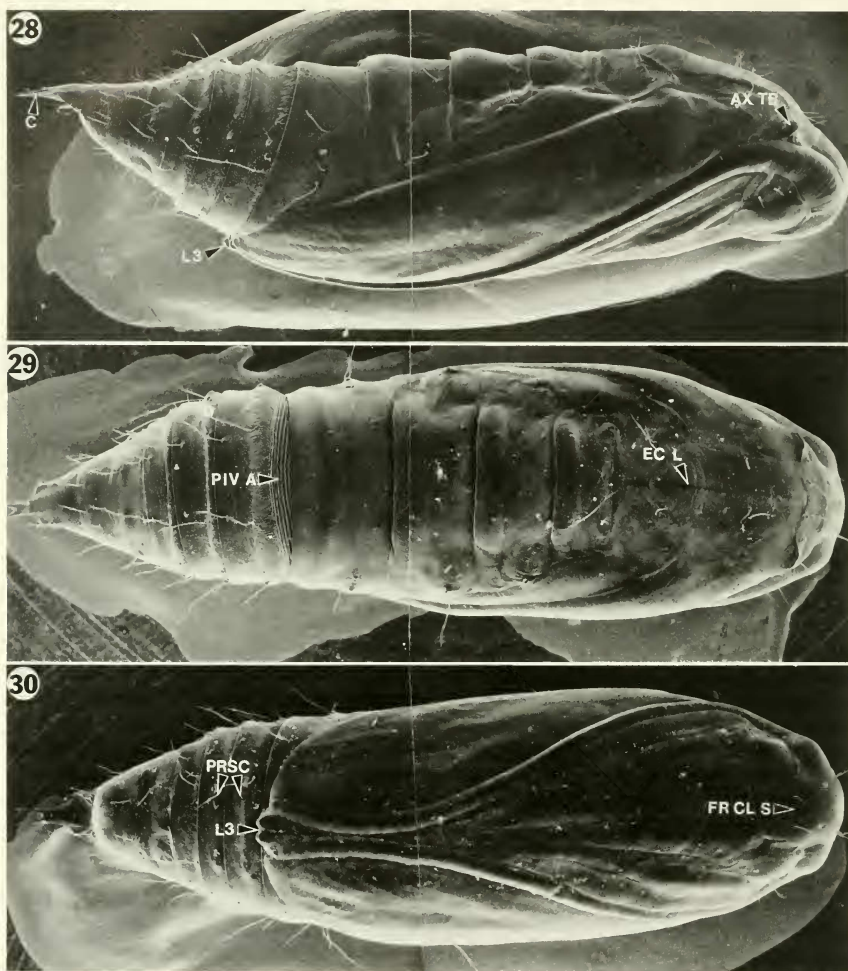
of mesothorax (Figs. 28-29, 31); epicranial suture V-shaped; fronto-clypeal suture present; antenna, maxilla, legs 1, 2, and apex of 3 exposed ventrally, femur of leg 1 exposed as short, narrow sclerite, leg 3 extending beyond margin of forewing; terminal six abdominal segments, pivoting as a unit from intersegmental area between fourth and fifth

segments, pivotal area with narrow ridges separated by areas with irregular rows of small pits (Figs. 29-32); A5-6 with scars of abdominal prolegs present; pupal setae long and straight, setae on cremaster are apically recurved (Figs. 30, 33-34).

Holotype.—♂, Miss.[issippi], Monroe Co., Hamilton, Amfac Nursery, 25 Aug. 1981,



Figs. 22–27. SEM of larvae of *Glyphidocera juniperella*. 22, Portion of A6 showing positional relationship between spiracle and SD group and tonofibrillary platelets, 200 $\times$. 23, SD1 and SD2 on A1. Note invagination (labeled “?”), 100 $\times$. 24, Tonofibrillary platelets and stellate integument (A1), 1000 $\times$. 25, A8–10, 50 $\times$. 26, Left proleg on A5, 500 $\times$. 27, Anal plate with large recumbent D2 setae and A10 prolegs, 100 $\times$.

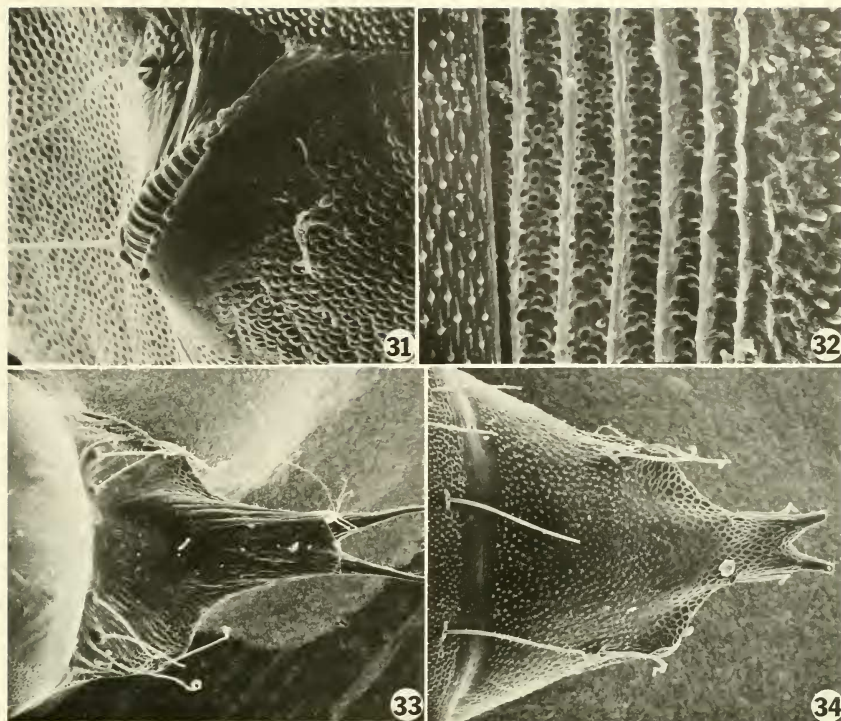


Figs. 28–30. SEM of pupa of *Glyphidocera juniperella*. 28, Lateral view, 30×. 29, Dorsal view, 30×. 30, ventral view, 30×.

David Tatum [Coll.]; iss. 14-IX-81, ex Gold Coast Juniper. The holotype is deposited in the U.S. National Museum on indefinite loan from the Mississippi Entomological Museum (MEM). Data are given as on labels except for bracketed information.

Paratypes.—Mississippi: Monroe Co.,

Hamilton, 25 Aug. 1981, R. L. Brown [Coll.], ex *Juniperus*, 2 ♂; David Tatum [Coll.], ex Gold Coast Juniper, em. 26–28 Aug. 1981, 2 ♂, D. Adamski genitalia slide no. 577; 5 ♀, D. Adamski gen. sl. nos. 542, 580, 582, and 2855; em. 29 Aug. 1981, 3 ♂, D. Adamski gen. sl. nos. 579, 585, and 2888;



Figs. 31-34. SEM of pupa of *Glyphidocera juniperella*. 31, Auxillary tubercle (= cocoon cutter), 400 $\times$. 32, Area demarcating pivotal area of pupa, 450 $\times$. 33, Ventral view of cremaster, 150 $\times$. 34, Dorsal view of cremaster, 150 $\times$.

3 ♀, D. Adamski gen. sl. no. 581; em. 3 Sept. 1981, 6 ♂, D. Adamski gen. sl. nos. 587, 2853, 2854, 2887, USNM gen. sl. nos. 11426, 11427; 3 ♀, D. Adamski gen. sl. no. 2856, USNM gen. sl. no. 11429; em. 5 Sept. 1981, 4 ♂, D. Adamski gen. sl. nos. 578, 584, and 586; 1 ♀, USNM gen. sl. no. 11428; iss. 12-IX-81, 4 ♂, 2 ♀. Paratypes of male and female are deposited in the British Museum (Natural History). Other paratypes are deposited in the Mississippi Entomological Museum (MEM).

Other specimens examined.—*Florida*: Gadsden Co., Quincy, larva coll. 1 Apr. 1981, *Juniperus horizontalis* "wiltoni," R. F. Mizell 2 ♂. *Maryland*: Prince George's

Co., Adelphi, VIII-8-1970, R. W. Hodges 2 ♀; USNM gen. sl. no. 81436. *Mississippi*: Hinds Co., Clinton, 20 Jul. 1963, and 24 Jul. 1963, Bryan Mather 2 ♀; Clay Co., West Point, Gold Coast Juniper, 5-23-80, J. D. Solomon; Hopkins no. S1705, 1 ♀. Larvae—*Florida*, Gadsden Co., Quincy, *ex Juniperus horizontalis* "wiltoni," Imperial Nursery, 1 Apr. 1984, R. F. Mizell, 10 fifth instars, 14 early instars.

DIAGNOSIS

Based upon the examination of type-specimens of all *Glyphidocera* species at the United States National Museum and British Museum, *G. juniperella* is most sim-

ilar in wing coloration and pattern to *G. barythyma* Meyrick, described from Forestburg, Texas and *G. rhypara* Walsingham, described from Guerrero, Mexico. However, specimens are paler in the latter two species. Males of *G. barythyma* can be distinguished from those of *G. juniperella* by the presence of abdominal sex scales only on tergum 3. *G. juniperella* has sex scales on terga 3 and 4. The male genitalia of *G. barythyma* have a cucullus that is broader at the apex, a shorter fingerlike projection at the base of the costa, and a larger and toothed cornutus. Males of *G. rhypara* can be distinguished from *G. juniperella* by presence of a narrow valval with a rounded apex and a dense setal cluster on the inner surface of the cucullus. Female *rhypara* have a more narrow antrum and broader eighth sternum. In addition, the denticles within the corpus bursae in *rhypara* are stouter and are not basally attached to each other as in *G. juniperella*.

DISCUSSION

Clarke (1969) was the first to illustrate abdominal sex scales and scale tufts on male *Glyphidocera*. *G. juniperella* males lack abdominal scale tufts; however, they do possess tergal sex scales. These scales normally cannot be seen on pinned specimens because they are covered by folded intersegmental membrane, but they are easily detected on dissected specimens. The characteristic exterior rims of fenestrae in these sex scales also occur at various sex scales of Tortricidae (Brown and Miller, 1983). The invagination or pit proximal to SD1 and SD2 on the larval abdomen may demarcate muscle attachments of dorsal chordotonal organs (Kristensen, pers. comm.), a pore, or some other structure of unknown function.

ACKNOWLEDGMENTS

We thank David Tatum, Mississippi Division of Plant Industry, for calling our at-

tention to this species through his initial collection; Russell F. Mizell, of the Agricultural Research Center, University of Florida, for providing us with immatures as well as reared material; Ronald W. Hodges, Systematic Entomology Laboratory, Agricultural Research Service, at the U.S. National Museum, and Klaus Sattler of the British Museum (National History) for their cooperation provided during the examination of type material; and Greta E. Tyson and Michael Sullivan, of the Electron Microscopy Center, Mississippi State University, for their help in the preparation of specimens and photographic plates. This research was supported in part by grants from NSF Grant BSR85-01212 and Sigma Xi.

LITERATURE CITED

- Albert, P. J. 1980. Morphology and innervation of mouthpart sensilla in larvae of the spruce budworm, *Choristoneura fumiferana* (Clem.) (Lepidoptera: Tortricidae). Can. J. Zool. 58: 842-851.
- Avé, D. A. 1981. Induction of changes in the gustatory response by individual secondary plant compounds in larvae of *Heliothis zea* (Boddie) (Lepidoptera, Noctuidae). Ph.D. dissertation. Department of Entomology, Mississippi State University. 89 pp., 4 tables, 37 figs.
- Brown, R. L. and P. R. Miller. 1983. Studies of Lepidoptera hindwings with emphasis on ultrastructure of scales in *Cydia caryana* (Fitch) (Tortricidae). Entomography 2: 261-295.
- Clarke, J. F. G. 1941. The preparation of slides of the genitalia of Lepidoptera. Bull. Brooklyn Entomol. Soc. 36: 149-161.
- . 1969. Catalogue of the Type Specimens of Microlepidoptera in the British Museum (Natural History) described by Edward Meyrick. Vol. VII. British Museum (Natural History), London. 531 pp.
- Grimes, L. R. and H. H. Neunzig. 1986a. Morphological survey of the maxillae in last stage larvae of the suborder Ditrysia (Lepidoptera): Palpi. Ann. Entomol. Soc. Am. 79: 491-509.
- . 1986b. Morphological survey of the maxillae in last-stage larvae of the suborder Ditrysia (Lepidoptera): Mesal lobes (Iaciniogaleae). Ann. Entomol. Soc. Am. 79: 510-526.
- Kornerup, A. and J. H. Wanscher. 1978. Methuen

- Handbook of Colour. 2nd ed. Methuen and Co., Ltd., London. 243 pp.
- Mizell, R. F. III and D. E. Schiffhauer. Evaluation of insecticides for control of *Glyphidocera juniperella* Adamski, (Lepidoptera: Blastobasidae: Symmocinae). Fl. Entomol. (accepted for publication).
- Schiffhauer, D. E. and R. F. Mizell III. Bionomics of *Glyphidocera juniperella* Adamski, (Lepidoptera: Blastobasidae: Symmocinae) a newly discovered pest of container-grown juniper. Fl. Entomol. (accepted for publication).
- Schoonhoven, L. M. and Dethier, V. G. 1966. Sensory aspects of host-plant discrimination of lepidopterous larvae. Arch. Neerlandaises Zool. 16(4): 497-530.
- Walsingham, Lord (Thomas de Grey). 1892. On the Micro-lepidoptera of the West Indies. Proc. Zool. Soc. Lond. 1892: 492-549.